Near-net-shape thermoplastic preforming with continuously automated cutting and robotic pick & place processes

1. Motivation
In modern helicopter industry production rates for one model typically vary from 50 to rarely 100 helicopters per year. Considering such low production rates it is mostly not possible to justify an extensive invest in automated production lines. The degree of capacity utilization of such lines is limited, and in most cases, the corresponding equipment remains idle. This is due to the fact that such production lines need to be able to handle different part geometries and are usually specialized for a particular product line. This restricts the flexibility of the equipment and increases the need for manual work and reconfiguration processes.

2. Production engineering

Production engineering is the engineering discipline that concerns the design and production of all types of man-made things. It covers a wide range of industries, from manufacturing to service industries such as healthcare. The main goal of production engineering is to design, develop, and implement processes and systems that can produce high-quality products efficiently and cost-effectively.

3. Automated cutting process

Once the cut piece geometries are defined and nested, this information can be sent to DLR’s automated cutting center consisting of a fabric roller and robotic pick & place system. The process can be automated by using robotic arms that can perform a variety of tasks, including picking up and placing objects, cutting, welding, and assembling.

4. Robotic pick & place process

A robotic pick and place process is a system that involves a pick-and-place robot, which can be used to pick up and place objects accurately and efficiently. These robots are commonly used in manufacturing processes where high precision and repeatability are required.

Fig. 3: Nesting for a skin part preform out of sliced UD layers, material utilization degree = 95%.

Fig. 4: DLR’s cutting center with movable drawer storage system.

Fig. 5: Handling of cut-pieces in 3 DOFs (2 translations, 1 rotation) under automated handling of cut-pieces on cutter table and lay-down in drawer storage.

Fig. 6: Drawer storage with cut-pieces on its way to a robot cell (above) and picking out of drawer storage (below).

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